



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/058,707	01/28/2002	Atsushi Ueda	10059-404US (P27007-01)	7373

570 7590 09/25/2003

AKIN GUMP STRAUSS HAUER & FELD L.L.P.
ONE COMMERCE SQUARE
2005 MARKET STREET, SUITE 2200
PHILADELPHIA, PA 19103-7013

EXAMINER

ALEJANDRO, RAYMOND

ART UNIT

PAPER NUMBER

1745

DATE MAILED: 09/25/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/058,707

Applicant(s)

UEDA ET AL.

Examiner

Raymond Alejandro

Art Unit

1745

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 January 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-15 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 28 January 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2. 6) ☐ Other: _____

DETAILED ACTION

Priority

1. Acknowledgment is made of applicant's claim for foreign priority under 35 U.S.C. 119(a)-(d). Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Information Disclosure Statement

2. The information disclosure statement (IDS) submitted on 01/28/02 (paper # 2) was considered by the examiner.

Drawings

3. The sheet of drawing filed on 01/28/02 have been accepted.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claims 1-14 are rejected under 35 U.S.C. 102(e) as being anticipated by Nakanishi et al
US 2003/0077517.

The present application is directed to a non-aqueous electrolyte secondary battery wherein the claimed inventive concept comprises the specific non-aqueous solvent used therein.

As to claims 1-11:

Nakanishi et al disclose a lithium secondary battery comprising a positive electrode, a negative electrode and a non-aqueous electrolyte containing a solvent and an electrolyte salt (SECTION 0009). It is disclosed that cyclic carbonic acid ester or a cyclic carboxylic acid ester is used as a solvent (SECTION 0007). Particularly, examples of the non-aqueous solvents are the following (SECTION 0027):

[0027] Examples of the non-aqueous solvents are cyclic carbonic acid esters such as propylene carbonate, ethylene carbonate, butylene carbonate and vinylene carbonate, non-cyclic carbonic acid esters such as dimethyl carbonate, diethyl carbonate and ethylmethyl carbonate, cyclic carboxylic acid esters or derivatives thereof such as γ -butyrolactone, γ -valerolactone and δ -valerolactone, furans or derivatives thereof such as tetrahydrofuran and 2-methyltetrahydrofuran, ethers or derivatives thereof such as 1,2-dimethoxyethane and 1,2-dithoxyethane, glymes or derivatives thereof such as diglyme, triglyme and tetraglyme, amides such as N,N-dimethylformamide and N-methylpyrrolidinone, alcohols such as ethylene glycol and propylene glycol, aliphatic carboxylic acid esters such as methyl acetate, ethyl acetate, methyl propionate and ethyl propionate, phosphoric acids or phosphoric acid esters, dimethyl sulfoxide, sulfolane or derivatives thereof, and dioxolan or derivatives thereof. One or more of them may be used. Especially, when one or more solvents selected from the

group consisting of cyclic carbonic acid esters, cyclic carboxylic acid esters, non-cyclic carbonic acid esters and aliphatic carboxylic acid esters are used, good characteristics are obtained and this is preferred. The effects of the present invention can be more conspicuously exhibited when cyclic carbonic acid esters or cyclic carboxylic acid esters which readily cause ring opening reaction or non-cyclic carbonic acid esters which readily cause ester interchange reaction, such as ethylene carbonate, butylene carbonate, vinylene carbonate, γ -butyrolactone, dimethyl carbonate, diethyl carbonate and ethylmethyl carbonate are used as a part of the electrolyte.

Art Unit: 1745

Nakanishi et al disclose that one or more of the foregoing solvents may be used; especially, when one or more solvents from the group consisting of cyclic carbonic acid esters, cyclic carboxylic acid esters, non-cyclic carbonic acid esters and aliphatic carboxylic acid esters are can be used (SECTION 0027).

As to claims 12-13:

Nakanishi et al disclose the following (SECTION 0031):

[0031] As the active material of positive electrode, there is used a lithium-containing composite transition metal oxide or a lithium-containing composite transition metal oxide in which a metal element other than the transition metal constituting the lithium-containing composite transition metal oxide is contained in the form of solid solution. Examples of them are LiCoO_2 , LiNiO_2 , LiMn_2O_4 , LiMnO_2 and LiFeO_2 , and, besides, these oxides in which a part of the transition metal (Co, Ni, Mn, Fe) is replaced with other transition metals, tin (Sn), aluminum (Al), magnesium (Mg), and the like.

In particular, Nakanishi et al disclose the lithium containing composite transition metal oxide containing Co and wherein part of the transition metal is replaced with Mg (SECTION 0031); the negative electrode material includes artificial or natural graphite (SECTION 0034).

As to claim 14:

As the electrolyte the following lithium salts can be used (SECTION 0009):
containing inorganic anion lithium salts comprising LiPF_6 , LiBF_4 , LiAsF_6 and LiSbF_6 and at least one member selected

Thus, the claims are anticipated.

6. Claims 1-9 and 12-14 are rejected under 35 U.S.C. 102(b) as being anticipated by Miyazaki et al 6162264.

Art Unit: 1745

With respect to claims 1-9:

Miyazaki et al disclose a lithium cylindrical ion secondary battery comprising a positive electrode, a negative electrode and a nonaqueous electrolyte obtained by dissolving a lithium salt into the solvent (COL 1, lines 35-52). It is further disclosed that as organic solvent there may be used (COL 15, lines 25-50/ Col 23, lines 40-60/Col 29, lines 20-40):

In this stage, there may be used, as an organic solvent, cyclic esters, chain esters, cyclic ethers, chain ethers or the like. The cyclic esters may be exemplified by propylene carbonate, butylene carbonate, γ -buthyrolactone, vinylene carbonate, 2-methyl- γ -buthyrolactone, acetyl- γ -buthyrolactone and γ -valerolactone. The chain esters may be exemplified by dimethyl carbonate, diethyl carbonate, dibutyl carbonate, dipropyl carbonate, methyl ethyl carbonate, methyl butyl carbonate, methyl propyl carbonate, ethyl butyl carbonate, ethyl propyl carbonate, butyl propyl carbonate, propionic acid alkyl ester, malonic acid dialkyl ester and acetic acid alkyl ester. The cyclic ethers may be exemplified by tetrahydrofuran, alkyltetrahydrofuran, dialkyltetrahydrofuran, alkoxytetrahydrofuran, dialkoxytetrahydrofuran, 1,3-dioxolan, alkyl-1,3-dioxolan and 1,4-dioxolan. The chain ethers may be exemplified by 1,2-dimethoxyethane, 1,2-diethoxyethane, diethyl ether, ethylene glycol dialkylether, diethylene glycol dialkylether, triethylene glycol dialkylether and tetrathylene glycol dialkylether.

As to claims 12-13:

It is disclosed that the following compounds can be uses as the positive active electrode material and the negative active electrode material (COL 13, lines 55-65/Col 18, lines 30-40):

for the positive electrode used in the present invention, there may be used at least one kind of lithium oxide such as LiCoO_2 , LiMn_2O_4 and the like, and chalcogen compounds such as TiS_2 , MnO_2 , MoO_3 , V_2O_5 and the like.

As an active material for the negative electrode, it is preferable to use metallic lithium, lithium alloy and carbonaceous material such as graphite, carbon black, acetylene or the like. When LiCO_2 is used as the active material for the

Art Unit: 1745

As to claim 14:

As the electrolyte the following lithium salts can be used (COL 15, lines 50-58):

As lithium salts as solute forming the nonaqueous electrolyte in cooperation with the above-mentioned organic solvent, there may be used inorganic lithium salt such as LiClO_4 , LiBF_4 , LiPF_6 , LiAsF_6 , LiCl , LiBr or the like, or

Hence, the claims are anticipated.

7. Claims 1-9 and 12-15 are rejected under 35 U.S.C. 102(e) as being anticipated by Takami et al US 2003/0118913.

As to claims 1-9:

Takami et al disclose a non-aqueous electrolyte secondary comprising an electrode group including a positive electrode, a negative electrode and a non-aqueous electrolyte including solvents and a lithium salt dissolved therein (ABSTRACT).

Takami et al further discloses the specific solvents containing γ -butyrolactone in a mixed solvent containing solvents such as (SECTION 0057-0059):

[0058] It is desirable to use a cyclic carbonate together with BL in the present invention because the cyclic carbonate permits improving the charge-discharge efficiency.

[0059] The cyclic carbonate used in the present invention includes, for example, propylene carbonate (PC), ethylene carbonate (EC), vinylene carbonate (VC), and trifluoropropylene carbonate (TFPC). Particularly, if EC is used together with BL, the charge-discharge characteristics and the large discharge characteristics can be markedly improved. It is also desirable to prepare a mixed solvent by mixing BL with at least one kind of a third solvent selected from the group consisting of PC, VC, TFPC, diethyl carbonate (DEC), methyl ethyl carbonate (MEC) and an aromatic compound. The mixed solvent of the particular construction permits improving the charge-discharge cycle characteristics.

Art Unit: 1745

Examples 15-18 show the following solvent combination (SECTION 0272-0275):

EXAMPLE 15

[0272] A thin nonaqueous electrolyte secondary battery was obtained as in Example 1, except that the nonaqueous electrolyte used was prepared by dissolving 1.5 mol/l of LiBF_4 in a mixed nonaqueous solvent consisting of 24% by volume of ethylene carbonate (EC), 75% by volume of γ -butyrolactone (BL) and 1% by volume of vinylene carbonate (VC).

EXAMPLE 16

[0273] A thin nonaqueous electrolyte secondary battery was obtained as in Example 1, except that the nonaqueous electrolyte used was prepared by dissolving 1.5 mol/l of LiBF_4 in a mixed nonaqueous solvent consisting of 23% by volume of ethylene carbonate (EC), 75% by volume of γ -butyrolactone (BL) and 2% by volume of vinylene carbonate (VC).

EXAMPLE 17

[0274] A thin nonaqueous electrolyte secondary battery was obtained as in Example 1, except that the nonaqueous electrolyte used was prepared by dissolving 1.5 mol/l of LiBF_4 in a mixed nonaqueous solvent consisting of 24.5% by volume of ethylene carbonate (EC), 75% by volume of γ -butyrolactone (BL) and 0.5% by volume of vinylene carbonate (VC).

EXAMPLE 18

[0275] A thin nonaqueous electrolyte secondary battery was obtained as in Example 1, except that the nonaqueous electrolyte used was prepared by dissolving 1.5 mol/l of LiBF_4 in a mixed nonaqueous solvent consisting of 25% by volume of ethylene carbonate (EC), 74% by volume of γ -butyrolactone (BL) and 1% by volume of toluene.

As to claims 12-13:

Takami et al disclose that as positive and negative electrode material the following compounds can be used (SECTION 0029):

[0029] Examples of the positive electrode active material are various oxides such as manganese dioxide, lithium manganese composite oxide, lithium-containing nickel oxide, lithium-containing cobalt oxide, lithium-containing nickel cobalt oxide, lithium-containing iron oxide, and lithium-containing vanadium oxide, and chalcogen compounds such as titanium-disulfide and molybdenum disulfide. Of these materials, lithium-containing cobalt oxide (e.g., LiCoO_2), lithium-containing nickel cobalt oxide (e.g., $\text{LiNi}_{0.8}\text{Co}_{0.2}\text{O}_2$), and lithium manganese composite oxide (e.g., LiMn_2O_4 and LiMnO_2) are preferably used because high voltage can be obtained.

Art Unit: 1745

As negative electrode material graphite can be used (SECTION 0038).

As to claim 14:

Takami et al teaches the following salt electrolytes (SECTION 0064):

[0064] Examples of the electrolytic salt contained in the nonaqueous electrolyte are lithium salts such as lithium perchlorate (LiClO_4), lithium hexafluoride (LiPF_6), lithium borofluoride (LiBF_4), lithium arsenic hexafluoride (LiAsF_6), lithium trifluoromethanesulfonate (LiCF_3SO_3), and bistrifluoromethylsulfonylimide lithium [$\text{LiN}(\text{CF}_3\text{SO}_2)_2$]. Of these lithium salts, LiPF_6 and LiBF_4 are most preferred.

As to claim 15:

Takami et al further disclose the following with respect to the solvent comprising a benzene-like or derivative compound (SECTION 0063):

[0063] It is possible to use a nonaqueous solvent containing BL in an amount larger than 50% by volume and not larger than 95% by volume, EC and an aromatic compound in place of the mixed nonaqueous solvent of the composition described previously. The aromatic compound is at least one compound selected from the group consisting of benzene, toluene, xylene, biphenyl and terphenyl. EC is deposited on

Example 41 shows the specific solvent mixing solution:

EXAMPLE 41

[0312] A thin nonaqueous electrolyte secondary battery was obtained as in Example 26, except that a nonaqueous electrolyte used was prepared by dissolving 1.5 mol/l of LiBF_4 in a mixed nonaqueous solvent consisting of 25% by volume of ethylene carbonate (EC), 74% by volume of γ -butyrolactone, and 1% by volume of toluene.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

Art Unit: 1745

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

10. Claims 10-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miyazaki et al 6162264 as applied to claim 1 above, and further in view of the European document EP 0796510.

Miyazaki et al are applied, argued and incorporated herein for the reasons above.

However, Miyazaki et al do not disclose the solvent comprising a glyme.

The EP'510 document discloses a non-aqueous electrolyte system consisting of a solvent mixture containing ethylene carbonate, g-valerolactone and optionally containing one or more additional solvents selected from other organic carbonates as glymes (SECTION 0010-0011/ CLAIM 1).

In view of the above, it would have been obvious to one skilled in the art at the time the invention was made to use the solvent comprising a glyme of the EP'510 document in the solvent mixture of Miyazaki et al as the EP'510 document teaches that a mixture of solvents comprising glyme can be used in electrolyte systems for batteries as they can be applied in a broad voltage

range, which has a conductivity higher than conventional conductivities at room temperature, and which shows a high stability against reduction.

11. Claims 10-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takami et al US 2003/0118913 as applied to claim 1 above, and further in view of the European document EP 0796510.

Takami et al are applied, argued and incorporated herein for the reasons above. However, Takami et al do not disclose the solvent comprising a glyme.

The EP'510 document discloses a non-aqueous electrolyte system consisting of a solvent mixture containing ethylene carbonate, g-valerolactone and optionally containing one or more additional solvents selected from other organic carbonates as glymes (SECTION 0010-0011/ CLAIM 1).

In view of the above, it would have been obvious to one skilled in the art at the time the invention was made to use the solvent comprising a glyme of the EP'510 document in the solvent mixture of Takami et al as the EP'510 document teaches that a mixture of solvents comprising glyme can be used in electrolyte systems for batteries as they can be applied in a broad voltage range, which has a conductivity higher than conventional conductivities at room temperature, and which shows a high stability against reduction.

12. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Miyazaki et al 6162264 as applied to claim 1 above, and further in view of Hamamoto et al US 2002/0001756.

Miyazaki et al are applied, argued and incorporated herein for the reasons above.

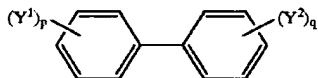
However, Miyazaki et al do not disclose the solvent comprising a derivative of benzene.

Hamamoto et al disclose the following (ABSTRACT):

(57)

ABSTRACT

A non-aqueous electrolytic solution favorably employable for a lithium secondary battery employs a non-aqueous electrolytic solution which comprises a non-aqueous solvent and an electrolyte which further contains 0.001 to 0.8 weight % of a biphenyl derivative having the formula:



In view of the above, it would have been obvious to one skilled in the art at the time the invention was made to use the solvent comprising a derivative of benzene of Hamamoto et al in the solvent mixture of Miyazaki et al as Hamamoto et al teach that by using the benzene derivative as a solvent, a non-aqueous electrolytic solution which is favorably employable for a lithium secondary battery and which shows high battery performance such as high electric capacity and high cycling performance under maximum operation voltage condition or elevated temperature is obtained.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Raymond Alejandro whose telephone number is (703) 306-3326. The examiner can normally be reached on Monday-Thursday (8:30 am - 7:00 pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick J. Ryan can be reached on (703) 308-2383. The fax phone numbers for the

Art Unit: 1745

organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

Raymond Alejandro
Examiner
Art Unit 1745

A handwritten signature in black ink, appearing to read 'RAM', followed by a long, sweeping horizontal line that extends to the right.